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ABSTRACT

This is the report of a conference sponsored by the Centre for Educational Research and Innovation. The conference discussed the findings of the Centre's 2-year program which attempted to demonstrate how the resource management of universities may be improved through better decisionmaking in the realms of finance, information, human flows, the use of physical plant and academic plans. The 2-year program utilized research and coordinating work conducted by the Centre and a tripartite agreement between the Organization for Economic Cooperation and Development, the member country's relevant government department and the universities themselves. It was found that private business enterprise models could not be directly applied to the university situation. New and practical approaches had to be developed. (Author/CS)

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INSTITUTIONAL MANAGEMENT IN HIGHER EDUCATION

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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Centre for Educational Research and Innovation (CERI)

INSTITUTIONAL MANAGEMENT IN HIGHER EDUCATION

Report of a Conference
to discuss the results of research initiated and
coordinated by the Centre for Educational Research
and Innovation in the O.E.C.D.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT
1972

The Organisation for Economic Co-operation and Development (OECD), which was set up under a Convention signed in Paris on 14th December, 1960, provides that the OECD shall promote policies designed :

- *to achieve the highest sustainable economic growth and employment and a rising standard of living in Member countries, while maintaining financial stability, and thus to contribute to the development of the world economy ;*
- *to contribute to sound economic expansion in Member as well as non-member countries in the process of economic development ;*
- *to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.*

The Members of OECD are : Australia, Austria, Belgium, Canada, Denmark, Finland, France, the Federal Republic of Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States.

The Centre for Educational Research and Innovation was established in June 1968 for an initial period of three years, with the help of a grant from the Ford Foundation which was later supplemented by a grant from the Shell Group of Companies.

The main objectives of the Centre are as follows :

- *To promote and support the development of research activities in education and undertake such research activities where appropriate ;*
- *To promote and support pilot experiments with a view to introducing and testing innovations in educational systems ;*
- *To promote the development of co-operation between Member countries in the field of educational research and innovation.*

The Centre functions as part of the structure of the Organisation for Economic Co-operation and Development, under the responsibility of the Council of the Organisation and the Secretary-General. It is supervised by a Governing Board of independent personalities appointed by the Secretary-General, in their individual capacities.

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PREFACE

An important part of the O.E.C.D.'s work in the field of economic policy revolves around growth - quantitative and qualitative. Only continued growth can provide the resources the world requires to cope with present and future needs and only increased attention to its qualitative aspects can respond to many of the pressing economic and social problems of the present time. In this process of growth and welfare, institutions of higher education, and in particular the universities, have become essential partners through the part they play in the creation of the intellectual resources of society. This has led them to accept new roles and objectives.

These new roles and objectives, involving a difficult balance between the scientific, cultural and educational aims of higher learning and research, in themselves conflict the management problem of those with leadership responsibilities in university affairs. The difficulties are further compounded by the fact that recent changes in the goals of universities have taken place at the same time as rapid growth in the enrolment rate of students and in the scale of resources. By consequence, formidable problems of relating resources to objectives have arisen with the result that all aspects of management to deal with them are now a vital issue in places of higher education.

In awareness of this, the Centre for Educational Research and Innovation undertook, with the co-operation of a group of universities in Member countries, a two-year research programme to demonstrate how their institutional management systems might be improved. The culminating point of this programme was a Conference over the four days, 2nd-5th November 1971, at which reports from the participating universities and CERI's professional staff were presented and evaluated. Twenty-one countries and 83 institutions of higher education were represented on this occasion and the self-application of all participants to its business, from beginning to end, was a clear endorsement of the method employed in this, and most other of CERI's programmes,

whereby research is shared between a few O.E.C.D. countries (in this case seven) while all Members can eventually discuss the results and draw whatever benefit from them they may choose.

It is not the intention of the present report to give, as it were, a blow-by-blow account of the Conference for most, if not all, of the contributed papers exist in readily available form already. What may prove useful in the long term, however, is a record of the discussions and the conclusions reached by so many men and women with professional standing in one or another branch of higher education - be they policy-makers, administrators, teaching staff or researchers. The O.E.C.D. valued highly the attendance of all and their names are recorded in this volume. Additionally, however, I shall express our particular thanks to Dr. E. G. Edwards, Vice-Chancellor of the University of Bradford and his distinguished colleagues on the Steering Committee of which he was Chairman, and Mr. Hans Löwbeer, Chancellor of the Swedish Universities and a member of CERI's Governing Board, who presided at all plenary sessions of this Evaluation Conference.

In a sense the Conference was the climax of a two-year research programme, but this does not mean that there will now be a decline in CERI's active interest in higher education. As the present report makes clear, the Conference itself (an independent ad hoc body) asked that the Centre should continue in its co-ordinating and research promotion role in the field of institutional management.

The Centre has now taken specific steps to invite institutions to participate in the future programme by becoming members. Explorations are under way to set up regional groups of projects concentrating on specific subject areas. The Centre will of course continue to co-ordinate this network of projects and provide a clearing-house facility for exchange of ideas and resource persons in the field of university management.

James R. Gass
Director
Centre for Educational Research and Innovation

I

THE PURPOSE AND METHOD OF THE CONFERENCE

In the summer of 1969 the Centre for Educational Research and Innovation initiated a programme of work that was directed at problems caused by universities being as yet so poorly prepared to plan or manage the vast resources they consume. It aimed, therefore, to demonstrate how the resource management of universities may be improved, through better decision-making in the realms of finance, information, human flows, the use of physical plant and academic plans.

This objective has been met by research and co-ordinating work carried out in the Centre and by special investigations of one or more of the component problems ("institutional self-studies") by eight universities within a tripartite agreement between the O.E.C.D., the relevant government department in the Member country concerned and the universities themselves. The total effort of the programme involved approximately 52 professional personnel and a cost of some 1,700,000 French francs - more than three-quarters of which was provided locally in the participating countries.

At the outset it was found that models worked out in the context of private business enterprise could not be directly transplanted into a university environment; new and practical approaches had therefore to be devised to tackle the special problems of higher education. Two years (and in some cases less) was not time enough for these to be fully tested; nevertheless sufficient work had been accomplished within this period to be subject for at least a first evaluation, and for this purpose a Conference was convened at the O.E.C.D. from 2nd-5th November, 1971. Its expressed aims were:

- to present the findings of the projects in institutional management sponsored by the Centre for Educational Research and Innovation to a wide audience of interested universities and Government officials;

- to evaluate and take stock of the current state of the art of university management and planning techniques with a view to making recommendations for future work;

- to seek the participation of institutions in future arrangements for inter-institutional communication and co-operation on university management.

So far as concerns the realisation of the first of these, an audience of some 192 representatives of universities (academic and administrative), government departments and international institutions, coming from 21 countries, assembled for the Conference and participated in its discussions. A nominal list is given in Appendix 2. Reports on all but very few of the research projects were available in full to all participants and each was the subject of an oral presentation. For manageability they were discussed, as appropriate to their topic, in one of four separate sessions concerned respectively with University-wide Decisions Models, University Information Systems, Curriculum Development and Academic Planning, and Cost and Resource Analysis for University Management.

To meet the second of the Conference's aims - evaluation and recommendations for the future - the results of these special sessions were made available to four Working Parties whose conclusions were presented to the final plenary meeting. These were concerned respectively with University Objectives and Synthetic Models, Specific Cost Effectiveness Techniques, Decision Structures and General Data Systems, and Inter-Institutional Co-operation and Communication Arrangements.

The third aim - future participation and co-operation among universities - was also developed in the final plenary session.

The method and organisation of the Conference were geared to a participation of a highly heterogeneous character. In addition to Government officials, it included university heads, university planning officers and experts in the field of management who had worked on the specific university problems. To take advantage of the size and diversity of the audience, participants were assigned to different working parties in the light of information they had given in advance of their particular interests

and preferences. Each of the four working parties was able, therefore, to discuss in some detail the specific problems in its mandate and come up with concluding statements.

Members of the working parties were encouraged to draw upon the presentations made in the previous sessions which were the result of the research work carried out within the CERI programme. To enable participants to choose the documentary material in accordance with their interests a system of individualised shelves was set up. Following the normal practice of professional associations, the bulk of documents was reserved in this way for perusal at the Conference while a detailed programme description and abstracts of papers had been prepared and mailed well in advance of the meeting.

How the plan worked out in practice may be seen by referring to the four-day programme schedule which is reproduced as Appendix 3.

II

INSTITUTIONAL MANAGEMENT IN HIGHER EDUCATION - THE BASIC ISSUES

The basic issues before the Conference were put in the first plenary session by Mr. H. Löwbeer and Dr. E. G. Edwards, and in the second ("University Democracy and Participatory Systems") by Professor R. A. de Moor and other speakers.

THE CHANGING OBJECTIVES OF HIGHER EDUCATION: H. LOWBEER

Speaking on the importance of recognising the university's proper objectives when applying models for its management, Mr. Löwbeer began by observing that the rapid changes that are now taking place in the industrialised countries and elsewhere have led to public authorities assuming an increasing role in managing large social services such as communications, transport, medicine, public health and education, and this has made it necessary to adopt or develop new management techniques. But the very utilisation of these techniques involves a number of value judgments - it is a heroic over-simplification to regard any of them as value-free - hence it is essential that the values and objectives of such institutions as universities should be explicitly analysed concurrently with their application. Without this, we are in danger of creating sophisticated technical exercises without any prospect of their being implemented.

Up to a point, the management techniques employed in higher education in the past were probably well enough suited to a small-sized system and the limited objectives it fulfilled. But the social developments of the last few decades have radically altered the importance and dimensions of higher education. A more equitable distribution of wealth has led, for example, to demands for improved social services, greater cultural opportunities, improved communications, a greater freedom to choose one's profession and so on. All these things increase the need for a labour force equipped with higher education. Nevertheless this post-secondary mass education must be considerably more diversified and more job-oriented than was formerly the case -

indeed it is becoming an important and versatile tool for carrying out development aims in a variety of social sectors and hence its planning must be integrated with overall planning on regional and national scales.

As to new objectives - young students, for example, are already demonstrating that higher education should address itself more specifically to vocational preparation and that it should be made relevant to a much broader spectrum of the labour market. For the higher age-groups it is becoming increasingly clear that higher education gets out of date more quickly than before and the requirement arises for professional men to return to post-secondary institutions - more than once, even - to renew their store of knowledge and effectiveness in the community. The third point in this brief look at the goals and objectives of universities is that the increasing social utility of higher education creates a demand for it to become more available and this, among other things, means more available in a larger number of localities. While still on this point, one should notice also that plans for developing private enterprises in new regions have to be co-ordinated with plans there for developing social services - including education which thereby becomes yet another instrument of regional development.

If we make a full list of objectives of higher education we find some are unrelated to each other, some are closely interrelated and others may conflict. In these circumstances those responsible for devising workable management techniques for higher education have an extraordinarily difficult and complex task ahead of them. This being so, Mr. Löwbeer considered it extremely valuable that representatives from so many countries were able to meet in Conference in order to exchange and summarise views on the results of their experimental programmes in different fields of higher education. It is obviously extremely difficult, if not impossible, he said, to apply the experiences of one country to another without first adapting them to local conditions. But it was his firm conviction that the collective experience gained in so many countries in the management problems of higher education in the course of the two-year CERI programme added up to a multi-faceted and comprehensive body of knowledge that cannot fail to provide each of them with fresh ideas for ways of attacking its own problems.

MANAGEMENT METHODS IN INSTITUTIONS OF HIGHER EDUCATION:
E. G. EDWARDS

In his keynote address to the Conference, Dr. E. G. Edwards posed the main problems to be evaluated as three questions: (i) What is the significance of new methods of institutional management to institutions of higher education and to their financial providers?; (ii) What are the methods? What validity do they possess?; (iii) How can the methods be applied in practice?

These new methods, he pointed out, are significant nationally because the expansion of universities involves expenditure which for the first time becomes comparable with (and therefore competitive with) other major national needs, and because the products of higher education, graduates and new knowledge, become for the first time of central importance to economic development and social stability or change. Their significance to universities and other places of higher education arises from: the problems of defining the purposes of higher education; the extent to which different objectives such as teaching and research are separable or inseparable; the conflict between innovation of new objectives and the continuance of old objectives; the tensions between different sections of staff and students; the possibility that new methods of management may optimise the realisation of objectives, achieve the best balance between them and stabilise internal social tensions.

The methods to be considered in the course of the Conference include: the application of specific techniques of economic analysis to existing university programmes and plans for their expansion or change; the creation and testing of models of the actual management systems in some existing universities and of proposed new systems; the question of the transferability of models and techniques between different institutions and different countries.

In practice, the application of these methods depends, Dr. Edwards suggested, on three factors - validity, communicability and the co-operation of all concerned. Of these validity will be judged not only by the professional experts in the field but by Executive Heads, Professors, Staff, Students and by national administrators. Each of these sections will have their own criteria of validity depending on their different ideas of

the objectives of higher education and their different concepts of the real factors that can be subject to variation and control. Communication depends both on an efficient management information system and a sufficiently close and continuous liaison between all concerned to ensure that data mean the same thing to different people and can be re-interpreted in new contexts in an agreed way. Special problems arise in obtaining a common understanding of the technical language of expert analysis. The university must be regarded as a continuous learning system in its own methods of management. As to the co-operation of all concerned in resource allocation and utilisation: higher education is a highly sophisticated business whose success is vitally dependent on the individual initiative of very talented individuals whether they are staff or students. For this reason negative incentives (sanctions) to co-operation in more effective institutional management are only rarely likely to be effective in anything other than the very short term. Positive incentives to co-operation are essential. These include direct financial or other material incentives but also, more importantly, the strengthening of the role function of individuals and groups at all levels. The balance between central control and de-centralised autonomy has also to be considered in this context.

On the conclusion of Dr. Edwards' address, observations were invited from the floor. There was, however, no time to discuss these - indeed most, if not all, related to the business of one or another of the sectional sessions that would be taking place later in the Conference. Their substance and range can, however, be summarised in the following questions or statements:

Do we need universities? What is the minimum that can still be called a university while parts are being progressively moved out into other sectors of the community? The role of universities in training for research should be intensified and the tendency of centres of research to be moved out of the universities should, in fact, be reversed. More should be done to inform students of their part and place in the system when they arrive at the university. They should be "helped to protect themselves". The science of administration and management has been kept out of the universities' purview for too long. Short-range planning becomes possible if a distinction is made between the various sections of management. But should the university

be considered as a sub-system of the whole of society or as a microcosm and therefore essentially different from the sub-systems already recognised? If we want to face the management problem in universities, all objectives must be defined. On the other hand, what is management? Who are the managers? Who manages whom? What factors can be changed and by whom?

In the search for solutions the accent had been so far on management; it was suggested that much more successful outcomes would result from intensive research leading to new techniques in teaching and learning that would altogether by-pass the traditional methods employed at the present time at ever-growing cost. This last point was raised again with some vehemence in discussion of the conclusions of Working Party N° 2 (see p. 43).

UNIVERSITY DEMOCRACY AND PARTICIPATORY SYSTEMS: R. A. de MOOR ET. AL.

This third basic issue was explored on 3rd November in a plenary session that was given as its purview: "Present development of participatory systems in universities and their performance, special attention being given to the participation of students and junior members of staff in decision-making, particularly as concerns curriculum, grading, staff recruitment, research policy and finance. Different kinds of systems, e.g. representation or direct participation. The political and legal environment in which participatory systems function and their domain of power. The role of government and legal regulations in curriculum and grading decisions, the appointment of staff and the approval of budgets. Criteria for the evaluation of university democracy, e.g. quality of education and research, academic freedom, motivation and sense of responsibility, encouragement of innovation, quality and efficiency of management".

Professor R. A. de Moor, in his opening of this session, pointed out that by linking "participatory systems" with "university democracy" (as the title did) the concept took on a special meaning. Democracy apart, participatory systems in universities could be seen as a prerequisite if purely functional objectives were to be achieved. In this case, questions as to who should participate, how and in what fields would be resolved from a functional viewpoint. This, however, has not been the approach in the European countries that had now established participatory

systems by law. Here, the basic motivation had been ethical and and the prevailing value-statement was that all members of the university community are equal citizens of it and must have equal rights in determining its policies. The claim "one man one vote" was inherent in this conception. The facts of division of labour, of expertise and differentiation in responsibility are not necessarily denied, but who is an expert, in what field and what this implies would be decided by the university community of equals. Thus, the political debate concentrates on the percentages of representation in the various councils or committees rather than the functional requirements of the institutions of higher education.

What has happened to the universities is not an uncommon phenomenon in the history of institutions. Most of them have grown by incremental policies of many participants and the changes in them do not reveal a purposeful single will. The resulting structures are at heart symbolic expressions of values and not instruments to achieve some accepted objectives.

Whatever the true genesis of the systems, however, Professor de Moor stressed that they already have great significance for the universities and it is highly important to know how they are functioning and the reasons for their successes or their shortcomings. No model for participation, or indeed no model for governance, can have the same outcome in all settings because the values, interests and abilities of the participants in decision-making differ so greatly. Thus, a given system might work well enough, say, in a social science department but fail in an engineering school. Further, decison-making structures are only part of the whole social structure; hence a specific system may be well adapted to the functional requirements of a teachers' training college, for example, but detrimental to a large university in which education, research and the social sciences have to be reconciled.

As to the criteria necessary for evaluation, Professor de Moor considered that the effectiveness in achieving the universities' objectives is the most important. The first of these objectives was output - the knowledge and attitudes acquired by students and the proportion of those reaching the required standards. The second objective in his view was the quality and quantity of research. After these there were others, with different

weights in different places, such as social service, social action and reforming society. Not all groups participating share the same objectives, however, and those that are shared may be partly incompatible with the implementation of structures and procedures. For these reasons there are bound to be different possible evaluations of the functioning of a given participatory system. Another important criterion for evaluation was the degree of innovation enabled by the system - for example in improving curricula, management systems and planning. To these he added a further two: the maintenance of academic freedom (a prerequisite for the advancement and transmission of knowledge) and the sense of responsibility and the motivation of all members of the university. Finally, he said, "we need to analyse whether the participatory systems....which are mainly characterised by the features of political democracy are not leading to the alienation of most teachers and students from their organisational environment".

Following the Chairman's address, the application of the "New Law" at the Technical University in Berlin was described by Miss E. Brickwell. This appeared to express itself as a system of unequals with different degrees of privilege. While four categories of people are represented - tenured staff, junior staff, students and employees with mixed academic and non-academic backgrounds - their influences are weighted differently. On the Faculty Council, for instance, eleven professors represent a total of 21 while three students represent about 500. The system imposes a need for collaboration between the groups and in the Faculty Council a simple majority is not enough; for example, if the students and junior staff form a coalition they will still need two professors to vote with them if their proposal is to succeed. So far as concerns the curriculum, if an innovation is passed in committee with a two-thirds vote, the Faculty Council must deliver a two-thirds vote to veto it. Viewed broadly, the Law is general enough to allow for a variety of interpretations and this leads to a great deal of complexity and polarisation over specific points in Faculty Councils. In the speaker's view neither the professors nor the students were happy about the major purpose of the Law - indeed it seemed that the student movement had been killed by it. The result was a sort of "integrated negation".

M. René Rémond then proceeded to outline the principles underlying the new participatory system in France and anticipated some of the difficulties that may arise in its application. Of the principles the most important are these: More autonomy for the universities which will be co-managed (co-management is not new since there has always been some degree of participation; the innovation is that participation will include everybody without exception). Secondly, participation will be extended to most university management and administrative activities. There will probably not be a one man one vote system, however, since this would over-weigh the student element. The University Council or a University Board and a parallel Scientific Council will administer teaching and research budgets respectively. People will be appointed by people of equal rank, and while the practical organisation of examinations will be in the hands of teachers and professors students can still have an influence in this sector.

As to possible difficulties in France, M. Rémond foresaw three in particular: uncertainty as to the proportion of representation from the various groups - students especially - taking part in appointments; a feeling of indifference rather than obstruction might set in and management efficiency may decrease substantially with the formation of large numbers of committees. Finally, the problem of government was as important as that of management and those occupying high-level roles must be fully aware that political efficiency may have more significance than managerial efficiency.

In the discussion that followed, Professor A. Jensen observed from experience he had as Director of two international agencies - one with many rules, the other with none - that he could comfortably manage both. The important thing was that individuals and minority groups should be protected.
Mr. B. Klemmensen, who claimed to be the only student representative at the Conference, was sharply critical of some of the "elegant super-participatory structures" that have appeared to suffocate the student movement. In his opinion, decisions as to research content should be taken by "the people" and not by those who were more interested in advancing science than service to society. Similarly, decisions over curricular topics ought not to be taken in the maze-like bureaucratic structure of skin-democracy but by the students.

From what was said later by several speakers from their experience of participatory systems in their own countries, it was clear that a number of institutions and governments were trying hard to find ways to include students and staff in decision-making, planning and management. It seemed equally clear, however, that such forms of participation as will evolve will be almost as numerous as the institutions themselves, each one being adapted to its own local situation and culture.

Professor de Moor closed the session by advising strongly that participation, as a political problem, should have a place in the development of models for planning and decision-making. While he did not elaborate on the consequences of not integrating participation with more technical research, it takes little imagination to anticipate what might re-occur if his recommendation goes unheeded. Participants collectively gave the impression that the situation was relatively quiet at present as concerns student unrest. It was no part of their agenda, however, to educe the reasons for this - whether the people concerned are satisfied or tired, whether or not we are in a calm before another storm, or whether or not public tolerance for manifestations of the unrest of students has been exhausted.

III

RESEARCH REPORTED AND DISCUSSED

Four simultaneous sessions of the Conference ("A"-"D") concerned themselves with institutional self-studies carried out within the CERI programme in eight universities, some of the research done in the Centre itself and three specially invited papers of relevance to the Conference's theme. In almost all cases the work had been the subject of a full report, copies of which were made available to participants beforehand (see List of Documents, Appendix 1). Each was introduced in a short oral statement by its author. For the benefit of readers who have not yet seen the full reports, the present account includes summaries that were also available to participants but not necessarily read out in formal session.

A. UNIVERSITY-WIDE DECISION MODELS

A.1 "Planning and Control of a University Management System at the University of Copenhagen": Professor Arne Jensen, The Technical University of Denmark.

The work on this project was carried out by a team in the Technical University of Denmark. It found that, for the University of Copenhagen as a whole, the number of students per full-time teacher in 1970 was about the same as in 1955, although the student/teacher ratio in the Humanities faculties is higher than in other faculties. With the relatively greater increase in the enrolment in the Humanities faculties the student/teacher ratio must have fallen there, otherwise the overall student/teacher ratio in the university would have increased. Nevertheless, the trend toward smaller class sizes (seminars) has increased the demand for teaching which has resulted in heavier teaching loads. This is one source of the discontent felt among students as well as by staff. However, the faculty of Natural Sciences acting on its own and without an overall university plan seems to have solved the problem by hiring increasing numbers of non-tenured teachers to alleviate teaching loads. This was done because of central restriction on the creation of tenured posts.

As for the budgeting and planning of the higher educational institutions by Government, excessive centralisation was found to be the root cause of major decision lags and disfunctionalities in university operations. The full report contains two charts, one describing the actual information flows, the other indicating desired information flows and decision points for university budgeting in Denmark.

The third major achievement of the Danish project has been the development of a dual analytical procedure using simulation of student and teacher flows as a basis for solving a two-level optimisation problem of the university. The two levels postulated are the university Senate and the Departments comprising the university.

The inputs to the model are the future expected teaching demands for each of the sectors, the future expected total resource quotas or ceilings available to the university and finally the current (initial) distribution of tenure and non-tenure teachers. These are presumably provided from the simulation. The model then works out, for each planning period, the allocations of tenure and non-tenure positions that best satisfy the overall teaching demands (taking into consideration that the cost and productivity per tenure and non-tenure position varies from one faculty to another) as well as different possibilities of substitution between tenure and non-tenure teaching that the faculty of Natural Sciences has actually been doing without using this optimisation procedure.

These differences are mainly a result of the different research and teaching policies and goals adopted by the faculties of the universities. Each time resource ceilings are changed, it is possible to calculate a new resource allocation pattern for the entire planning horizon. Changes in the demands for teaching can also be introduced to find out the resource implications. Finally, the model can be used to evaluate how resource allocations are affected if one sector wants to introduce an innovation that will affect its unit cost or its productivity in terms of manpower inputs.

Discussion

In his oral presentation, Professor Jensen emphasized how revealing the work had been as to political interactions between universities and government, social interactions between

universities and society, and problems within the university itself. He stressed the need for co-operation between different interest groups in order to clarify the decision-structure and to prepare the ground for conflict resolution. Subsequent discussion developed round several of these topics, notably the relative power of Rector and Council, how to measure achievement and whether mathematical programming models should be intended as tools for direct planning or a means for clarifying the quantitative aspects of problems under review.

A.2 "Models Relating Educational Programmes, Research Programmes and Student Numbers to Personnel and Space Requirements at the University of Nijmegen":
J. M. L. Goossens, The Catholic University of Nijmegen.

The Nijmegen team distinguishes fixed-time activities (teaching) from non-fixed time activities (research supervision) and then goes on to estimate in great detail how each staff member spends his time in a number of activities comprising a programme. Using the Department of Psychology as a test case, they found that 93 per cent of the staff time on an average can be attributed to student-related activities. This provided the rationale for using the student flow model to estimate the requirements of teaching man hours. The team then goes on to show how step by step it is possible to work out the costs in order to come up with the total budget for current expenditures.

More significant, however, is their conclusion, after a self-evaluation of the model constructed by themselves, that the fundamental aspects of education and research and their mutual interaction are still beyond the team's reach. They propose next to use systems-theory to describe and analyse this interaction process.

Discussion

Mr. Goossens, in talking about the use of models for planning and budgeting at Nijmegen, distinguished between three types in particular: (i) those intended to derive the consequences of particular decisions, (ii) projective models concerned with the consequences of future change and (iii) allocation models to reveal the best use of resources for given objectives. He pointed out the advantages of clear formulation and quantification in giving a deeper insight into the actual cost structure

(classified by students and departments) and the changes consequent on expansion. He posed the question whether university objectives are derived from the decision-taking process. The discussion that followed ranged over the difficulty of allocating joint costs, the calculation of ancillary personnel requirements and the problem of estimating the time distribution of staff activities.

A.3 "Planning University Development: Cost Projections and Academic Implications for Alternative Development Strategies for Five Years and Upward at the University of Lancaster": Professor M. G. Simpson, University of Lancaster, United Kingdom.

The work of the Lancaster team is the subject of a 159 page report and it can be best summarised, perhaps, in terms of the eight inter-related projects whose results were finally merged into a university-wide development plan to assist the quinquennial planning process. These were:

(i) Department Models of Teaching Loads: The study of nine Departments within the University, in which detailed surveys were made of the effect on teaching loads of different course structures, and student numbers. The use of these studies within some Departments, and the formulation of general hypotheses for University planning purposes - in terms of staff and student numbers. Some special problems - for example the special teaching loads experienced in newly established Departments.

(ii) General Growth Pattern During 1972-77: The problem of how best to move in aggregate, from the size expected in 1972 to that planned for 1977, taking into account balances in student population and intake rates, and other (financial) constraints.

(iii) Student Course Preferences: Studies on the choice of supplementary courses, and switches in "major course" intentions, for which substantial scope exists within the degree structure; the effect of such switches on the general planning process; and the ways in which they might be altered by changes in the control processes allocating staff increases to Departments, and by the setting up of new Departments and courses; and the interaction between this and the conclusion of (i) and (ii) above in terms of staff requirements.

(iv) Allocation of Funds to Library: Studies of the ways in which funds would be dispersed in order to provide given levels of library service; the derivation of "book stock increase" likely to arise from given levels of funding, with particular reference to the (particularly high) inflationary tendencies in book and serial prices; the interpretation of proposals for total library budgets into alternative forms for decision-making purposes.

(v) Academic Staff Costs: The effect on average university staff costs of a substantial expansion in staff numbers, through the estimation of staff resignations, promotions and appointments and average salary levels appropriate to each.

(vi) Virement: An exploration of possible forms of virement, allowing Departments more internal control of their total allocation of resources; and ways in which such procedures could be extended to encourage departmental "academic preferences" to affect the development of ancillary common services - such as computing, technical teaching aids.

(vii) Administration Services: A study to determine appropriate ways of setting levels of secretarial and administrative staff within Departments - their relation to numbers and seniority of academic and other staff.

(viii) Flexibility in Building Design: A study on a major new "Arts" teaching building for a nominated group of Departments; the resolution of the conflict between having "custom-built" accommodation for each of the Departments, and the inherent uncertainty in the rate of growth initially planned for each.

Discussion

In his presentation Professor Simpson referred to the work at Lancaster as an essentially operational research activity concerned with such matters as how best to implement a decision to raise student numbers over a period of years - the differential phasing of expected growth. Problems of staffing were looked at from both ends, i.e. staff changes consequent upon increased numbers and changes in student population thought desirable by existing and future staff. The latter produced a feed-back system of external pressures on the university to expend, and ideas from within the university as to desirable activity levels. Professor Simpson emphasized that his team's approach was one "from below"

aimed at early and implementable results with no attempt being made to challenge basic concepts. In discussion it was questioned how far an operational research department could investigate itself and its environment while still avoiding bias and opposition.

B. UNIVERSITY INFORMATION SYSTEMS

B.1 "Development and Testing of an Information System for Forecasting Student Entrants, Flows and their Success Rates at the University of Novi Sad": Professor Stjepan Han, University of Novi Sad, Yugoslavia.

The Novi Sad team joined the CERI programme some time after its beginning but has already begun to examine the inflow, throughflow and outflow of students at the university. Detailed examination is being made of subject choices by the students, their transfer propensities and their success rates. Regional and socio-economic backgrounds of students are considered as factors determining the transition and transfer co-efficients linking the departments/faculties and levels of study at the university.

The inquiry, covering 1,200 secondary school leavers in the autonomous region of Voivodina, showed that 80 per cent of high school students planned to continue their education at the university. Interest in studying Law, Social Sciences, Natural Sciences and Medicine was far greater than for Agronomy, Economics, Engineering and Technology. The training in the latter subject fields, however, was more meaningful in view of the economic structure of the region in which the university was located.

Finally, a special study of the student flows in the Faculty of Economics may reveal some of the factors responsible for the large number of leavers after the first or second year of study.

Discussion

The questions raised by Professor Han's paper hinged on how stable such an isolated university system could be. A single university cannot but be connected with all the other universities in its own country and this was an important reason for variations in intake and migrations. The answer given was "This is our life; we should measure what is, not what could be".

B.2 "Practical Problems in Connection with the Planning and Introduction of Information Systems at the Free University of Berlin": Traugott Klose, Free University of Berlin, Germany.

The team working on this topic in the Free University of Berlin is not formally linked with the CERI programme, nevertheless its results are expected to be of considerable relevance to a complete spectrum of field studies.

The Act of 16th July, 1969 concerning the universities of the "Land Berlin" and acknowledged as very progressive has brought sweeping changes in the organisation, planning and decision-making at the Free University of Berlin. Mr. Klose's paper first surveyed the principal of these reforms. It then considered a number of specific problems that were engaging the attention of his team, notably: the planning and introduction of an information system for technical data and space use, the planning of an information system on students in connection with a new student registration procedure, and the planning of an information system on personnel employed by the University. The paper concluded with a brief consideration of the results of this work as they might bear upon the utilisation of capacity models.

Discussion

Participants gained the impression that the organisational structures of the new universities in Germany are becoming more and more complex - not least as they concern decision-taking. It was asked what the consequences of this would be in terms of an adequate information system within a university. The answer at present appears to be that they are unknown.

B.3 "Development of a Preliminary Planning, Programming and Budget Framework for Graduate Training and Research Activities at the Chalmers University of Technology": Claes Appelquist, Chalmers University of Technology, Gothenburg, Sweden.

The Preliminary Planning, Programming and Budget System's methodology has been tested since 1968 at the Chalmers University of Technology. Development work hitherto has been concentrated in the field of undergraduate education. The present study, however, concerns the application of PPBS to graduate training and research activities within the university. The project will lead

to specific proposals regarding the definition of goals and objectives of graduate training and research, programme structure, organisation at the national level as well as within the university, principles of organisation and decision-making in the PPBS, principles of resource-allocation and the use of output concepts.

Many doubts have been raised recently concerning the use of the Programming and Budget framework itself; but the Chalmers' endeavour to explore its applicability by going to the grass roots may yet produce evidence of its usefulness.

There was, regrettably, no time for discussion of Mr. Appelquist's paper at the Conference.

B.4 "The National Centre for Higher Education Management Systems at WICHE: Its Nature and Scope": Dr. Ben Lawrence, Associate Director of the Western Interstate Commission for Higher Education and Director of the Planning Management Systems Division, Boulder, Colorado, United States.

The goals of the National Centre for Higher Education Management Systems (NCHEMS) of the Western Interstate Commission for Higher Education are the improvement of higher education institutional management, the improvement of statewide co-ordination of higher education, and the improvement of decision-making processes in higher education at the highest national levels. The NCHEMS programme is concerned with the development of tools for deriving all categories of information relevant to resource allocation at the institutional, state, and national levels and the training of users and potential users in their implementation.

The major functional areas for research and development essential to the improvement of higher education management are goal setting, programme planning and resource allocation, execution, evaluation, and communication base development. Although the Centre's efforts reflect on all five areas, its current thrust addresses the areas of programme planning and resource allocation and communication base development.

Included in the NCHEMS effort toward a communications base are projects concerned with the development of standardized terminology, uniformly defined data bases, and common procedures and

conventions. Its effort in the area of programme planning and resource allocation is directed toward the development of models and other tools that will aid in the investigation of the relationships between variables and possible future effects as one or more of these variables are changed.

Discussion

The first question put to Dr. Lawrence was about the applicability of WICHE programmes to different universities and colleges. In reply, Dr. Lawrence said that the programmes are tested for different computer types as well as for quite different institutional and organisational contexts. They can be handled on-line or off-line. The programmes are designed for flexible application. This is important if one wants to handle the problem of changing structures. Simulation of structural changes of the input as well as of the output side of the models has been started and the resulting models will be available at the end of 1973.

As regards the implementation of the models, Dr. Lawrence mentioned that the co-operative organisation of WICHE has shown a degree of active participation much higher than expected. The dissemination of the models is supported by supplying the programmes and the documentation with additional training programmes. The WICHE model using a university should provide at least one analyst as technician for handling the programme and one decision-maker to give the input data and to interpret the results. It was added that the models developed by WICHE are of pratical use. They are designed by administrative people of the universities to meet their own information needs.

C. CURRICULUM DEVELOPMENT AND ACADEMIC PLANNING

C.1 "Faculty-Student-Industry Co-operation in the Design and Management of the Post-graduate Programme in Economics at Nanterre": Professor Guy Terny, Université de Paris-X, Nanterre, France.

This was a progress report of work undertaken at the Université de Paris-X, Nanterre in order to determine the aims, programmes, educational methods, etc., of the Diplôme d'Etudes Supérieures (DES) de Sciences Economiques which would satisfy the preferences and attitudes of those concerned with improving the general organisation of studies leading to this DES.

The three main interested parties are: (a) the students (4th year undergraduates and those currently working for their DES); (b) university academic staff; and (c) the potential employers of DES graduates in the Paris region.

The information needed was collected by means of questionnaires adapted to each of the parties concerned. Among the initial results to emerge from the processing an opinion survey of 314 students of the 4th year in Economics is the observation that the Licence (first degree) is sufficient to enter the higher degree programme. But 93 per cent of the students did not consider this Licence as adequate for the profession of their choice. The reasons given were that their studies were not sufficiently specialised, had little application value and were not coordinated to effect a smooth transition to professional life.

One reason for entering the higher degree programme rather than the labour market direct seems to be their fear of competition in the professions for which they felt inadequately prepared. The student body was equally divided as regards the orientation of the DES programme - half of them stressing the professional interest while the other half desired to pursue pure and applied economic research. Should there therefore be two distinct graduate programmes satisfying these different needs? This question, according to the students, implied that the academic organisation in terms of examinations, class sizes and forms of teaching, etc., should also be different to accord with the type of course preferred.

Discussion

Several participants urged that one of the basic reasons why students continued their studies beyond the first "Diplôme" was a fear of entering active life. The organisation of long training courses should help to reduce this fear.

C.2 "Making Higher Education a New Product for a New Market": Dr. Erling Olsen, Rector, Roskilde University Centre, Denmark.

In June 1970 the Danish Parliament decided to set up a University Centre in Roskilde near Copenhagen to open in September 1972. The job of its Governors was, to a large extent, like that of any other producer changing a product for the élite to a product for the masses. Responding to criticism and to the new

demands of society, they decided to change the institutional set-up, the degree system, the curricula, the teaching methods and the evaluation procedures that were hitherto traditional in Denmark.

As to the institutional set-up, they have chosen one very similar to the German Gesamthochschule. The Centre will be one, and only one, institution educating the future policeman as well as the future member of the Supreme Court. So far as the degree system is concerned, every student will have a general two-year education and he can choose from three "schools": Philology, Social Sciences and Natural Sciences. These will provide entry to a wide range of specialised courses in which the Centre can give him higher education for a further three years, or even more. This system will increase mobility on the academic labour market and in the teaching profession, for if there is over-production of graduates in one specialised field and a shortage in others transfer will not require a full new education. The system also allows for recurrent education and for studies at different institutions, the student getting credit for courses taken elsewhere.

In teaching, the approach will be multidisciplinary and most of it will be done in small groups. Final evaluation will not be in grades or classes; the student will either have "passed" or "not passed". If education is expanded, as envisaged, and teachers use 45 per cent of their time on research work, then research will get a proportionate expansion. It is intended also to make research more directly useful for the world outside the university by establishing procedures that would respect the Centre's autonomy and yet enable research for the public sector and industry to be done there.

Finally, some "marketing" must be done so that university graduates may be employed where they were not employed before. Dr. Olsen ended with a prophesy that "mass higher education will make it necessary to pay students an ordinary salary for their work at university".

Discussion

Some participants remarked that the reform, as presented, did not appear to reduce the total duration of studies and that the reduction in number of formal lectures would be favourable only to those students capable of working by themselves.

C.3 "An Example of Interdisciplinary Education as Featured in the Integrated Teaching Programme in Medical and Health Sciences": Professor Ihsan Dogramaci, Rector, Hacettepe University, Ankara, Turkey.

Hacettepe University was established in 1967 by the separation of the former Medical Centre from Ankara University. It now embraces other disciplines, notably Social Sciences, Humanities, Physical and Biological Sciences and Engineering.

The educational principles of which Professor Dogramaci spoke were formulated as long ago as 1958 by the staff of the Children's Medical Centre from which the Ankara Medical Centre grew. Experience in their implementation in the years that followed has led to the following conclusions.

In a university medical centre that includes the fields of medicine, dentistry, pharmacy, nutrition, physical medicine, nursing and medical technology there should not be separate disciplinary departments but rather common institutes to serve all the different areas and specialities - for example, institutes of anatomy, physiology, biochemistry and biology.

The curriculum should not be organised on the basis of named disciplines (e.g. anatomy, physiology, bio-physics), but should be integrated in an interdisciplinary approach. A course on cell biology, for example, should include morphology, biochemistry and physiology, both in health and disease. The curriculum should not be static and to avoid this interdisciplinary committees should have a continuous obligation to evaluate the curriculum design, taking into account student views. Continuing improvement and innovation should be the goal.

Discussion

In essence, the discussion expressed a general concurrence as to the importance of pluridisciplinary courses for students intending to go into general medicine.

D. COST AND RESOURCE ANALYSIS FOR UNIVERSITY MANAGEMENT

D.1 "Cost-Effectiveness: A Study of Potential Economies per Student Year at the University of Bradford": Professor J. A. Bottomley, University of Bradford, United Kingdom.

The number of students in higher education in Great Britain has been growing at a faster rate in recent years. In this study, made at the University of Bradford, unit costs are worked out and compared for each department at the "undergraduate" level. Only direct costs are taken into account and the results show that science studies (laboratory-based studies) cost two-and-a-half times more than social science studies (classroom-based studies). This considerable difference is not fully offset by the difference in future earnings, the private rate of return for science studies (7 per cent) being lower than that for social science studies (10 per cent).

The savings that could be made by keeping enrolment constant but cutting down the time that teachers and students are in contact (lectures, tutorials, groups and seminars), or reducing the number of options offered, or by increasing the number in the class, are, in the final analysis, slight and would have to be paid for by lower quality of teaching. Conversely, substantial savings could be made by increasing total enrolment (a reduction of 30 per cent in five years for a reasonable programme). Another advantage of economies of scale is that they do not lower the quality of teaching. More rational use of accommodation would also produce substantial savings since buildings are the largest factor in unit costs.

Discussion

The discussion of this paper is, perhaps, best reflected by recalling the questions asked and the answers given by Professor Bottomley. The principal of them were these:

Why do teaching costs account for a much lower percentage than they do in France (where the figure is 60 to 70 per cent)? Because time spent on research and teaching post-graduates is not included.

Why is the reduction in costs only small if class numbers are increased? Because the share of salaries that "undergraduate" education accounts for is only a small percentage of the cost.

What conclusions can be drawn as regards teacher salary policy? Those ready to teach outside normal hours could be paid more, or two teaching shifts could be organised.

Why is there a sharp increase in the "staff cost index" at the 80 figure? The base figure is 60; since the size of a class is 20, this must be the reason for the difference at 80.

Does the University of Bradford think students should be guided in the direction sign-posted by the rates of return? This is a delicate matter. The report will be issued and this may reduce the demand for laboratories from certain professors whose laboratories seem, at the moment, to be under-utilised and show much higher costs than the average. But it is the Government that should be most concerned by this study since the problem for the Government is to obtain the same results at lower cost.

The need to produce scientists has been repeatedly stressed; a comparison between the rates of return leads to the opposite conclusion. What decision will be taken as a result of this study? The cost of science studies can be reduced without reducing the number of scientists. If this is done the rate of return will climb. In addition a scientific training inculcates modes of thought which can be applied to all problems.

How many hours teaching are given? Eight to ten hours for social sciences; 15 hours for science.

Possibly the University of Bradford is not representative in that it consists of a large number of small specialised departments where economies of scale are possible? This is true; the University of Bradford is essentially a technological university but costs can be reduced in other universities as well.

If students compare rates of return won't they consequently flock into the social sciences and alter the structure of salaries? Students are guided not by rates of return but by their ability or inability to do mathematics.

D.2 "Report on the results of the Survey on University Staff, facilities and expenditure": Berger Fredriksen, Centre for Educational Research and Innovation, O.E.C.D.

This study gives the results of a survey made by CERI in 1968-1969 among universities in Europe and North America. It attempts to explain the differences in a certain number of indicators at the level of each department in five major areas.

Thirty-two different types of university departments were analysed by grouping them into six major subject fields and five regions. The studies showed that large differences observed in the number of students per academic staff member for departments within Pure Sciences, Technology and Medical Sciences on the one hand, and departments within Humanities, Law and Social Sciences on the other, are caused by differences in the teaching and research programmes carried out. It was also found that differences in the total number of teaching hours provided per week were the most important reason for the differences observed in student/staff ratio.

A study of the distribution of academic staff on three levels according to rank (professional level, middle level and junior level) for selected universities shows that faculties of Pure Sciences, Technology and Medical Sciences have a smaller proportion of the total academic staff in the professional rank and a higher proportion in the junior ranks than faculties of Law, Theology and Social Sciences. An important factor causing the differences in staff structure is that different subject fields have experienced different rates of growth in the student numbers. Fields with a strong increase in student numbers tend to have a higher proportion of the total staff in the lower ranks than fields experiencing a lower growth in student enrolment, since new teachers are recruited in the junior or middle ranks.

Although the total number of teaching hours scheduled for higher degree students is for all fields lower than for first degree students (on the average around 25 per cent lower), the average seminar group size is only half of the group size for first degree students. Differences in group size seem to be the most important reason for differences in costs between students at the two levels.

Correlation co-efficients calculated suggest stronger correlations between academic and administrative staff than between administrative staff and students enrolled. This implies that, when determining the future need for administrative staff, the growth in the academic staff may be a better basis than the growth in the student enrolment numbers.

Regressions based on the sample appear to suggest that economies of scale would be practically nil. It also appears that costs involved vary considerably from one area to another for a given department. Finally, the report discusses the current state of information availability in the universities surveyed.

Discussion

The principal questions asked, or observations made, about Mr. Fredriksen's paper were: Is the data sufficiently accurate and comparable? - Providing a list of indicators would have been a simpler and less costly method than filling out a long questionnaire - How can the training of university administrators be improved? - A rational policy, which is the criterion of decision, is rarely based on economic deficiency criteria - The size of the sample is too small for drawing significant conclusions.

To these Mr. Fredriksen replied: The objective of the CERI study was to inform, data being practically non-existent hitherto in most countries. The research shows, inter alia, the differences in cost as between various departments in the universities studied. He added that it is pointless to develop a management system unless it is applied, and that is not possible without the agreement of those who have to do the managing.

D.3 "Comparative Studies in Costs and Resource Requirements for Universities": Professor Keith Legg, Loughborough University of Technology, United Kingdom.

The paper on which Professor Legg's oral presentation was based is broadly divided into two parts. The first presents a simple approximate internationally data-based university overall mathematical resource model derived from an original analysis of a 15-University international sample from the CERI 1968-1969 Information Survey. It provides a method of estimation of staff and costs at departmental (or equivalent structure) level in terms of twelve broad subject areas and these are then used to derive

staff, areas, recurrent and some capital expenditures at the overall university level. The results of a typical example are given. For the University of Loughborough the model forecasts personnel requirement of which academic staff represent an average of 50 per cent of the total requirements, and support staff 35 per cent at departmental level. Results from this model should help in decision-making but are by no means intended as a substitute for policy decision-making itself.

The second part presents a generalised conceptual/data-based methodology for the calculation of university departmental academic, supporting the administrative staff by broad subject area and geographical region. The methodology has been specifically formulated to accommodate different types of student programmes and the method is illustrated by examples from a typical British University.

The paper includes relevant observations on international university comparative data derived from the CERI survey.

Discussion

Questions asked, or comments made, included the following:

What is the purpose of this model: to forecast and allocate resources, to conduct a comparative study or to forecast resource requirements? - Which are the exogenous and endogenous variables? Which are those that can be influences? - The model puts forward co-efficients without raising the question of the co-efficients it would be desirable to have - Resources in the model are unlimited - Average propensities are described at international scale and they are used for projections without questioning the economic and technological significance of these relationships - The model assumes extreme institutional rigidity - What is the significance of co-efficients based on a heterogeneous sample?

Professor Legg's reply to these en masse had to be brief. In essence, he said that the model does not rely on constants based on the survey results. Each university can calculate the constants applicable to itself. The information he was able to give, though partial, is all that is available at the moment. The co-efficients based on the 80-university sample are practically the same as those derived from the 15 universities used in the model.

E. REPORT ON STUDIES IN INSTITUTIONAL MANAGEMENT IN HIGHER EDUCATION

by Dr. Abdul G. Khan, Head of Programme, Centre for Educational Research and Innovation, O.E.C.D.

(Taken in plenary session, 4th November)

This report is a synthetic statement of CERI's work on institutional management in higher education. The first part provides the background and traces the evolution of the programme over the last two years. The second part gives an overview of the work of the eight field projects which, as already reported, were described and discussed in Sessions "A"-"D" of the Conference. The third part describes the in-house research focussed on a pioneering survey of university staff and facilities among one hundred institutions. The final part draws a number of lessons with regard to the role and limitations of management science in the management of university institutions. Throughout the report references are made to parallel and complementary work in other institutions known to the Centre.

Although a full statement of all this work is now generally available as an O.E.C.D. Technical Report, it is relevant here to recall some points in particular to which participants' attention was drawn because this session provided much of the basic information that enabled the Working Party on "Inter-Institutional Co-operation and Communications Arrangements" to make its recommendations to the Conference (see p. 48).

Of first importance was the fact that, through the CERI programme of field projects and in-house research, it has been demonstrated that management methods can indeed be developed for universities to solve specific problems. The major, but interrelated, dimensions recognised were: Decision-participation, Finance, Information, Human Flows, Physical Plant and Equipment and Academic Planning. So far, parallel effort in the development of methodology to incorporate multiple objectives in the management process has not been pursued.

The field studies were specifically aimed at producing practical results in the country of origin but with an applicability for more general use. The in-house research was mainly based on an international University Information Survey to provide

comparative data across countries and general resource models. It should be noted, however, that the research and development time of two years or less could not yield considerable study in depth including testing.

Four meetings of the various project leaders provided some measure of inter-project co-operation and facilitated progress reports on the work being undertaken. These meetings were the direct source of setting up of a Steering Committee of Rectors and Vice-Chancellors that guided the O.E.C.D. Evaluation Conference.

The CERI statement concluded with some initial reflections on the total effort. It is asserted that the various approaches need to be tested, particularly in terms of their validity, communicability and the extent to which positive incentives can encourage their use. In various areas real progress has been made towards the manageability and information requirements of a modern university with, in some cases, challenging proposals for the future. Much still remains to be done, however, and the report points out that there is a long way to go before a verdict can be passed on the outcome of the high interest generated by the total programme.

Finally it appears that the justification for continuation of the research collaboration depends on three major factors: the opportunity for universities to draw on wider experience than their own; the opportunity of continued inter-university dialogue on latent problems of management; and, lastly, the demonstration and diffusion of promising techniques through a clearing-house facility.

Discussion

Several speakers paid tribute to the quality and progress of the CERI programme, especially in view of the short time-scale of the researches to date. It was emphasized that much was still to be done and that in particular attention needs to turn to a wider interdisciplinary approach involving administration science, organisational sociology and suchlike in parallel with the resource and cost effective aspects that had been emphasized so far. Objectivity and decision models were of special importance.

Some discussion centred on the problem of academic staff-administrator communications. The CERI programme had generated some progress here but more as a by-product than through an objective research programme. It was stressed that this matter needed close future attention. What is more, the problem of achieving participation between individuals with right of autonomy is not confined to universities, so if the universities can succeed in this area their approach might have wide applicability in other institutions of society.

Reference was made to training programmes. CERI had only achieved a very limited but useful experience in this area through an internee exchange programme. It had not proved possible to develop more general training programmes up to the present time.

The Council of Europe observer expressed his Councils' appreciation of the satisfactory co-operation already developed between them and the O.E.C.D. and pointed out that it had helped avoid duplication of work. He hoped that such co-operation would continue and expand in the future.

IV

CONCLUSIONS OF THE EVALUATION CONFERENCE

The conclusions of the Conference were reached by study of the previous sectional deliberations in four subject areas by Working Parties appropriate to each, and endorsement of their recommendations in the final plenary session on 5th November. In the following statement of these conclusions, the divergent views of individuals or special comments are distinguished by close spacing.

1. SYNTHETIC MODELS AND UNIVERSITY OBJECTIVES

Chairman of Working Party: Professor Dr. G. Brenninkmeijer

Purview of the Working Party: Normative models of universities as distinct from descriptive or empirical models - the definition of university objectives in terms of who sets them and how they are formulated - the formulation of normative constraints for university models - the dichotomy arising from the evaluation of economic co-efficients versus education co-efficients of university models - the implementational aspects of model building with emphasis on the human and financial resources devoted and the gains that are likely to accrue.

1.1 At the start of the discussion about models and the place of objectives within these models, emphasis was laid on the fact that a sort of dangerous mystique may develop around models and model-building. Mankind has been thinking in models for thousands of years; but the possibilities offered by mathematical models represent a promising step in this thinking because it is possible to manipulate more variables at the same time. The expectations as regards the applicability of mathematical models should not be too high, because the work is still in a tentative and preliminary stage.

1.2 Considerable progress has been made in the field of descriptive models. The problems in normative/optimising models are numerous, for in these the objectives and the objective functions plan an important role.

1.3 The following objectives may be formulated for the university as a system:

- student needs
- social needs for educated manpower
- research
- freedom to experiment

1.4 But it must be pointed out that we can perhaps better speak of the influences of society on the university (and vice versa) - influences that can be steered to some extent - than about explicit objectives of the university. Furthermore, it must be stressed that the processes within the system are equally determined by all sorts of hidden objectives as by explicit objectives.

1.5 When speaking of explicit objectives, it might be useful to define objectives more in terms of what has not been done than in terms of what has been done.

1.6 The following specific proposals were made:

(i) To make one comprehensive report of the work which has so far been carried out in different places under general headings of objectives, decision structures and types of models used.

(ii) To have a communications network between the national planning organisations, research institutes in this field and university administrators about the work carried out in the area of institutional management in higher education. The O.E.C.D. should take the initiative for such a network.

(iii) To organise a committee of university administrators and other experts in this field who would find management methods which are both theoretically sound and operational.

Feeling that such a committee should be balanced in favour of administrators as distinct from model-makers was strong. It was further suggested that there was also too much emphasis here on outside influences; there should be full freedom "to innovate from within".

2. SPECIFIC COST-EFFECTIVENESS TECHNIQUES FOR UNIVERSITY MANAGEMENT

Chairman of Working Party: Dr. Alan M. Cartter

Purview of the Working Party: The need for developing an adequate data base for decision-making both for short-term budgeting and long-term planning - how budgeting procedures can be improved to provide effective cost control without ignoring qualitative factors - whether or not improved inter-university and international cost comparisons would provide better benchmarks for measuring performance - the importance of economies of scale - at what point do administrative inflexibilities and sacrifices in educational quality offset such financial economies? - constraints limiting increases in productivity.

2.1 In the problem of cost-effectiveness techniques and their application it was clear that the objective of making effective use of resources was common to all institutions and to all national systems, and that the constituent elements of cost were similar in all countries. However, the historic differences in form and structure, the somewhat different social perspective of various institutions, and the differences in method of funding and in information systems led us to conclude that economic comparisons and policy generalisations are not easy to arrive at.

Two participants proposed that "cost awareness" should be used in the place of "cost effectiveness" in this communication.

2.2 The group discussed the concept of optimum size, and while recognising great variation in common acceptance of what constituted an "ideal" size university from one country to another, there was broad acceptance of the position that individual academic disciplines were reasonably comparable and were the appropriate units to study.

One speaker observed that this does not indicate the intensity of disagreement on the optimum size of a university. The position should be spelt out: the United States favours large universities, the United Kingdom small ones, while France's choice lies between, e.g. some 15,000 students. There was, however, some agreement that there may be an optimum size for departments - hence optimum size for the university might well be related to the number of disciplines it houses.

2.3 Most participants agreed that comparative data on space standards, student/staff ratios, teaching loads and unit costs could be useful, but that great caution should be observed in making data truly comparable under standard definitions. There was real need for internationally accepted standards in this respect. It was recognised that individual institutions

might make less use of such comparative data than would central agencies which had broad responsibility for the allocation of capital and recurrent funds to universities.

2.4 The group encouraged the development of improved information systems both for internal management purposes and for external use in improving resource allocation among competing educational uses. It was recommended that greater emphasis in future studies be placed upon unit cost per degree, for purposes of international comparisons, rather than on costs per student year.

Unit cost per degree was not universally accepted as an appropriate criterion for international comparison, useful as it might be nationally. One speaker gave a warning as to the limitations of computer models. MIS is expensive. Research should continue, but the costs of techniques should be kept down. The Working Party's recommendations should include an observation on how costly systems can be.

2.5 Concern was expressed that budgeting procedures, and particularly allocation formulas, too frequently tend to omit (or dampen) incentives for innovation and improved cost-effectiveness. Many formulas for allocating funds assume proportionality between the number of students on the one hand and the number of faculty and the amount of classroom and laboratory space on the other, therefore producing a constant cost environment in which economies of scale cannot emerge. It was felt that greater attention should be given to building in incentives for economy.

2.6 Considerable institutional and social economies are potentially available in university education through changes in course structure, sufficient expanision to make better utilisation of teaching resources, improved use of physical facilities, shortening of time spent in courses, alteration of the academic calendars, and perhaps some increase in teaching loads. Some of these monetary economies, however, may include sacrifices in the quality of education, the attention devoted to research and community affairs, and the flexibility in meeting new and emerging demands on the university.

It was observed by one participant that there is very little evidence at present of cost savings except in very small and growing universities. Research has been carried out in small and very specialised institutions and its results should be tested in more comprehensive and more traditional universities.

2.7 New forms of higher education, as represented by the Open University, revived interest in the United States in the external degree, and in-service training for post-graduates were recognised as having economic importance. It is too early, however, to conclude which kind of forms of more independent education will have a significant overall impact.

It was added that mass education was forcing a change on the tasks of universities as they had been conceived up to the present. Developments must take place in three respects particularly: the total magnitude of the tasks, their nature and number, and the nature of the decision-making function.

2.8 The group encouraged CERI to continue its efforts to foster the collection and interchange of data on educational costs and outputs. It also encouraged wider distribution of the results of its studies. Most participants agreed that they would be increasing government pressure to better document the claim on resources, and to rationalise the allocation process. It was felt that greatest progress would be made by individual countries improving their own data collection processes and analyses, since there is much greater comparability of objectives and structure among universities within a single country. CERI might most effectively work with the government agencies to aid them in improving their procedures, though in the first instance such improvement should be a matter for the universities themselves. Out of this process somewhat greater sophistication and comparability of information would emerge over time.

Several participants were concerned lest certain of these recommendations, and possibly some of those of the other Working Parties, might seem to incite the O.E.C.D. to overlap the functions of other international institutions such as UNESCO and the Council of Europe. The proposal should be that the O.E.C.D. might collaborate with these other bodies in matters of information and such relevant programmes they might have in hand.

It was further recommended that cost-effectiveness techniques should be applied under the auspices of CERI to the possibilities of educational technology (i.e. novel and existing methods) in meeting the needs of the university for the masses. One speaker went further and said that the documents of the Conference made universities appear to be no more than administrative machines. There had been no real consideration of teachers, students or alternative pedagogical methods. University management should not be taken in too limited a sense; it clearly should include the promotion of innovation in teaching methods and technology, research on which should be started at once (he hoped on CERI's initiative) to test their cost-effectiveness. Two other participants spoke similarly on the importance of pedagogical research and the necessity for developing new teaching methods. Both regretted that such essential elements as students

and educational methods should have had no place in the Conference - "we must know what we are doing with ourmoney to be sure that we are educating our students as well as possible within the resources available to us".

For the CERI Secretariat it was explained that the O.E.C.D.'s Institutional Management in Higher Education project which, in effect, delimited the purview of the Conference, was part only of a wider programme that had other constituent projects dealing specifically with most, if not all, of the topics whose omission from the agenda had just been remarked upon. In short, CERI itself shared the wider conception of the term institutional management. To have introduced these other topics for discussion on the present occasion, however, would have broadened the spectrum beyond the point where the Conference could efficiently discharge the function it had accepted to itself - that of evaluating the work carried out over the last two years in one specific and very important sector. The speaker hoped participants would feel assured on this point if he mentioned just some of the titles of projects recently completed or still being pursued in CERI's overall programme of work, namely Educational Technology, Computers in Mass Education, New Concepts of Pedagogy, a European Centre for the Learning Sciences, Innovation in Higher Education, Curriculum Development, Educational Growth and Educational Opportunity. Under consideration, too, was a cost-effectiveness study of really mass university education.

3. DECISION STRUCTURES AND GENERAL DATA SYSTEMS IN UNIVERSITIES

Chairman of Working Party: Dr. Erling Olsen

Purview of the Working Party: A comparison of the different decision structures of the universities that have carried out CERI development projects - how the existing data systems of these universities are geared to their decision structures - alternative decision structures - how data systems can be adapted to the decison structure of the university in order to ensure that only the necessary and sufficient information is transmitted for decision-making purposes.

3.1 In discussing the different decision structures of the universites, the Working Party recognised that the same types of decisions had to be made in the different institutions. They were, however, made at different levels of the hierarchies, with different participation rates for different interest groups, using different information systems. The Working Party was of the opinion that a multitude of decision structures and information systems would and should exist in the future.

3.2 Within each decision structure, the decision-makers - whoever they were - would need better tools for their work, i.e. better data systems and better methods of using the data. They should also have had experience of using models.

3.3 The CERI project teams have developed such methods and proposed new data systems. The Working Party was of the opinion that the emphasis of the future work should be put upon the possible practical implementation of the results of the theoretical work.

3.4 This would demand a reformulation of parts of the reports into a language familiar to university administrators. It would also demand an effort of teaching and training university administrators in modern management. The Working Party recommended a strengthening of CERI's programmes in this field.

It was interpolated by the Secretariat that CERI at present had no such training programme. The Centre might be able, at most, to mount a pilot project, but whatever it could do would be small in comparison with what the universities might undertake. One Rector added that the universities ought to start their own training in this field rather than rely on some international scheme.

3.5 The implementation of the results of the CERI project teams might in specific cases imply a continuation of parts of the theoretical work and, perhaps, the start of new research projects. The Working Party was of the opinion that CERI should pay attention to these possibilities.

3.6 One of the new areas of possible research discussed by the Working Party was methods of assessing the educational consequences of structural changes in the university system.

3.7 The Working Party discussed the international transferability of the software of university data systems. It was proposed that CERI should consider organising an international co-operation in this field.

3.8 The Working Party paid attention to the need of facilitating international comparisons of data by clear and acceptable definitions of the individual data items. Some members of the Working Party were in favour of the establishment of an international data bank. Others felt that such a data bank would be of little value to administrators and not a future task for CERI.

3.9 Finally, the Working Party discussed how CERI could be a centre of exchange of information on management in higher education. It also discussed the possibility of CERI helping individual countries with information on developments on the labour markets for graduates.

4. INTER-INSTITUTIONAL CO-OPERATION AND COMMUNICATIONS ARRANGEMENTS

Purpose of the Working Party: To assist the Centre for Educational Research and Innovation to launch the next phase of its programme of innovation in university management.

Chairman of Working Party: Dr. Abdul G. Khan

4.1 The discussions at this Conference have shown both the need for, and the widespread interest of universities in, the further development of specific approaches to and emphasis on university management.

4.2 There is in consequence a need for a more systematic effort to organise and disseminate available information on university management methods to the universities, assisted by appropriate efforts by international organisations.

4.3 So far as the programme on Institutional Management in the field of Higher Education conducted by the O.E.C.D.'s Centre for Educational Research and Innovation is concerned, it was agreed that ways and means should be found for this effort to be continued in areas where international efforts are necessary as a complement of national activities. The R & D efforts of a small group of universities, which have constituted the basis for the present Evaluation Conference, should be used as a starting point for a more widespread and intensive effort of co-operation between those universities which now wish to initiate research and development efforts in this field.

4.4 It is necessary, because further development of improvements of university management are needed, that CERI should continue to promote research in this field. In addition to the continuation of such R & D, a group of universities (not less than 20) should be invited to evaluate and further develop the methods developed in the existing O.E.C.D. programme and discussed at this Conference. These efforts by a group of universities should be assisted by appropriate arrangements for international co-operation, including the participation in the work of research teams by members from other universities. Efforts should be made to encourage centres involved in the study of university management problems to specialise in the field.

4.5 In order to make the results from the work of the group mentioned under paragraph 4 available to interested universities, the possibility of establishing a "clearing-house" for information in the field of university management should be seriously examined.

4.6 The Conference emphasized that the success of these efforts will depend on the active participation of the universities themselves, in collaboration with national authorities, in accordance with arrangements prevailing in the individual O.E.C.D. Member countries. The Secretariat of the O.E.C.D. is therefore invited to consult interested universities, national authorities and experts and to propose, as soon as possible, specific measures for implementing the above proposals.

4.7 As soon as the appropriate consultations have been completed, the O.E.C.D. is requested to call a meeting of those universities which have expressed a definite intention to participate, in order to consider a definite programme of work reflecting their several interests and to make proposals for its organisation and financial support.

One participant desired that the following observation be added to the conclusions reached by the Conference. International relations between universities - and that is what we have been talking about, albeit on a limited front - cannot but involve exchange of students, of staff and of research results. There is no possibility of internationality without such exchange. At present it is insufficient in all these respects and its rectification will, of course, raise problems of procedure and finance between States and within the universities themselves. He hoped it would be seen as no less important in the field of institutional management than in other developing aspects of higher education that these problems should be speedily overcome.

APPENDIX 1

LIST OF DOCUMENTS

Publications

Studies in Institutional Management in Higher Education

Costs and Potential Economies by J. A. Bottomley et al., University of Bradford, 434 pp., O.E.C.D., Paris, 1971.

Decision, Planning and Budgeting by A. Jensen et al., University of Copenhagen, 207 pp., O.E.C.D., Paris, 1971.

Planning University Development by M. G. Simpson et al., University of Lancaster, 159 pp., O.E.C.D., Paris, 1971.

Comparative Studies in Costs and Resource Requirements For Universities by K. Legg, 140 pp., Technical Report, O.E.C.D., Paris, 1971.

Development of a Model for Some Aspects of University Policy by J. L. M. Goossens et al., The Catholic University of Nijmegen, 139 pp., Technical Report, O.E.C.D., Paris, 1971.

Forecasting Student Entrants, Flows and Success Rates by S. Han et al., University of Novi Sad, 44 pp., Technical Report, O.E.C.D., Paris, 1971.

Méthodologie pour la Rénovation du Diplôme d'Etudes Supérieures de Sciences Economiques by G. Terny et al., Université de Paris X-Nanterre, 102 pp., Technical Report, O.E.C.D., Paris, 1971.

Subject Field and Regional Variations in Student/Staff Ratios, Academic Programmes and Recurrent Expenditures by B. Fredriksen, 69 pp., Technical Report, O.E.C.D., Paris, 1971.

The Development of Planning, Programming and Budgeting Systems by C. G. Appelquist et al., Chalmers University of Technology, 84 pp., Technical Report, O.E.C.D., Paris, 1971.

Report on Studies in Institutional Management in Higher Education by A. G. Khan et al., 36 pp., Technical Report, O.E.C.D., Paris, 1971.

Contributed Papers

Curriculum Development and Academic Planning with reference to Medical and Health Sciences by I. Dogramaci, Hacettepe University, Ankara, 11 pp., CERI/IM/71.37, Paris, 1971.

Making Higher Education a New Product for a New Market by E. Olsen, Roskilde University Centre, Denmark, 8 pp., CERI/IM/71.50, Paris, 1971.

Management Methods in Institutions of Higher Education by E. G. Edwards, University of Bradford, 9 pp., CERI/IM/71.44. Summarised in the present report, O.E.C.D., Paris, 1972.

The National Centre for Higher Education Management Systems at WICHE by B. Lawrence, 7 pp., CERI/IM/71.34, Paris, 1971.

Evaluation Conference on Institutional Management in Higher Education, Programme and Abstracts, 15 pp., CERI/IM/71.36, Paris, 1971.

APPENDIX 2

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APPENDIX 3

Tuesday, November 2nd

10.00 am - 1.00 pm

ROOM 1 - INAUGURAL SESSION

Address by Mr. Benson E. L. Timmons III, Deputy Secretary-General of the O.E.C.D.

Statement by the Conference Chairman: Mr Hans Löwbeer, Chancellor of the Swedish Universities.

Statements by Mr James R. Gass, Director of CERI and Dr Abdul G. Khan, Head of Programme.

Keynote Address: "Management Methods in Institutions of Higher Education", by Vice-Chancellor E.C. Edwards, University of Bradford, United Kingdom.

(Rapporteur: Mr. Ian Cox, CERI)

3.00 pm - 6.00 pm

PARALLEL SESSIONS

ROOM 1 - SESSION A. University-wide Decision Models

Chairman: Dr Morris G. Kendall, Scientific Control Systems, London, U.K.

1. "Planning and Control of a University Management System at the University of Copenhagen", Professor Arne Jensen, The Technical University of Denmark.

2. "Models Relating Educational Programmes, Research Programmes and Student Numbers to Personnel and Space Requirements at the University of Nijmegen", Mr. J.L.M. Goossens, The Catholic University of Nijmegen, The Netherlands.

3. "Planning University Development: Cost Projections and Academic Implications for Alternative Development Strategies for Five Years and Upward at the University of Lancaster", Professor M.G. Simpson, University of Lancaster, U.K.

Rapporteur: Dr George Morton, University of Konstanz, Federal Republic of Germany.

ROOM 2 - SESSION B. University Information Systems

Chairman: Mrs Dorothy Gilford, US Office of Education, Washington DC, U.S.A.

1. "Development and Testing of an Information System for Forecasting Student Entrants, Flows and their Success Rates at the University of Novi Sad", Professor Stjepan Han, University of Novi Sad, Yugoslavia.

2. "Practical Problems in Connection with the Planning and Introduction of Information Systems at the Free University of Berlin", Mr Traugott Klose, Free University of Berlin, Federal Republic of Germany.

3. "Development of a Preliminary Planning, Programming and Budgeting Framework for the Graduate Training and Research Activities at the Chalmers University of Technology", Mr Claes Appelquist, Chalmers University of Technology, Gothenburg, Sweden.

4. "The National Centre for Higher Education Management Systems at WICHE: Its Nature and Scope", Dr Ben Lawrence, Associate Director of the Western Interstate Commission for Higher Education and Director of the Planning Management Systems Division, Boulder, Colorado, U.S.A.

Rapporteur: Dr D.L. Freytag, Hochschul-Informations System GmbH, Hannover, Federal Republic of Germany.

7.30 p.m. BUFFET

Wednesday, November 3rd

10.00 am - 1.00 pm

ROOM 1 - SESSION C. Curriculum Development and Academic Planning

Chairman: Professor Pierre Tabatoni, Université de Paris-IX Dauphine, Paris, France.

1. "Faculty-Student-Industry Cooperation in the Design and Management of the Post-graduate Programme in Economics at Nanterre", Professor Guy Terny, University of Paris X, Nanterre, France.

2. "Making Higher Education a New Product for a New Market", Dr Krling Olsen, Rector, Roskilde University Centre, Denmark.

3. "An Example of Interdisciplinary Education as Featured in an Integrated Teaching Programme in Medical and Health Sciences", Professor Ihsan Dogramaci, Rector, Hacettepe University, Ankara, Turkey.

Rapporteur: Monsieur B. Girod de l'Ain, Université de Paris IX Dauphine, Paris, France.

ROOM 2 - SESSION D. Cost and Resource Analysis for University Management

Chairman: Mr Christian Morrisson, Centre National de la Recherche Scientifique, Paris, France.

1. "Cost-Effectiveness: A Study of Potential Economies per Student Year at the University of Bradford", Professor J.A. Bottomley, University of Bradford, U.K.

2. "Report on the Results of the Survey on University Staff, Facilities and Expenditures", Mr Birger Fredriksen, CERI.

3. "Comparative Studies in Costs and Resource Requirements for Universities", Professor Keith Legg, Loughborough University of Technology, U.K.

Rapporteur: Monsieur L. Levy-Garboua, Centre de Recherche de Documentation sur la Consommation (CREDOC), Paris, France.

TION - PARIS 2nd-5th NOVEMBER, 1971 - SCHEDULE OF MEETINGS

<table>
<tr><td>November 3rd, Contd.</td><td>3.00 pm - 6.00 pm</td><td colspan="4">PLENARY SESSION

ROOM 1

<u>PANEL</u>: UNIVERSITY DEMOCRACY AND PARTICIPATORY SYSTEMS
<u>Chairman</u>: Professor R.A. de Moor, Chairman, Committee for Higher Education, The Netherlands.
<u>Panel Members</u>: Messrs. Arne Jensen, Denmark; Jussi Ilvesmäki, Finland, René Rémond , France; Ugo Trivellato, Italy and other invited members.
<u>Rapporteur</u>: Mr. Raymond Jurkovich, State University of Leiden, The Netherlands.</td></tr>
<tr><td rowspan="3">Thursday, November 4th</td><td>10.00 am - 1.00 pm</td><td colspan="4">PARALLEL SESSIONS</td></tr>
<tr><td></td><td>ROOM 1
Working Party No. 1

<u>University Objectives and Synthetic Models.</u>

<u>Chairman</u>:
Prof. Dr G Brenninkmeijer
Rector,
The Catholic University of Nijmegen,
The Netherlands</td><td>ROOM 6
Working Party No. 2

<u>Specific Cost Effectiveness Techniques for University Management.</u>

<u>Chairman</u>:
Dr Alan M. Cartter,
Chancellor,
New York University,
New York, U.S.A.</td><td>ROOM 3
Working Party No.3

<u>Decision Structures and General Data Systems for Universities.</u>

<u>Chairman</u>:
Dr Erling Olsen,
Rector,
Roskilde University Centre,
Denmark.</td><td>ROOM 4
Working Party No.4

<u>Inter-institutional Cooperation and Communication Arrangements.</u>

<u>Chairman</u>:
Dr Abdul G Khan,
CERI,
Head of Programme, Institutional Management in Higher Education.</td></tr>
<tr><td>3.00 pm - 4.15 pm</td><td>(Continued)</td><td>(Continued)</td><td>(Continued)</td><td>(Continued)</td></tr>
<tr><td></td><td>4.45 pm - 6.00 pm</td><td colspan="4">ROOM 1 - PLENARY SESSION - <u>Chairman</u>: H. Löwbeer - Chancellor of the Swedish Universities

1. "Report on the Programme for Institutional Management in Higher Education", Dr. Abdul G. Khan, Head of Programme.
2. Discussion.

<u>Rapporteur</u>: Professor Keith Legg, Loughborough University of Technology, U.K.</td></tr>
<tr><td>Friday Nov. 5th</td><td>10.00 am - 1.00 pm</td><td colspan="4">ROOM 1 - PLENARY SESSION - <u>Chairman</u>: H. Löwbeer - Chancellor of the Swedish Universities

1. Working Party Recommendations - Chairmen of the Working Parties.
2. Discussion.
3. Conclusion of the Conference - Professor E.G. Edwards, Vice-Chancellor, University of Bradford, U.K.

<u>Rapporteur</u>: Mr Ian Cox, CERI.</td></tr>
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